NATURAL RESOURCES CONSERVATION SERVICE
CONSTRUCTION SPECIFICATIONS

COVER CROP

1. Scope

The work shall consist of furnishing all materials and performing cultural operations necessary to grow and maintain the cover crop to protect soil, improve soil conditions, conserve moisture, provide temporary protection for permanent vegetative cover, add biomass to the soil, improve infiltration and tilth, reduce compaction, manage pests and nutrients, and/or provide supplemental forage.

2. Materials

Seed. Seed used in this specification will meet the requirements as stated in Kansas Noxious Weed Law (K.S.A. 2-1314) and the Kansas Agriculture Seed Law (K.S.A. 2-1415).

When seed is purchased, the seed tags will be evidence of the purity and germination of the seed. Time since date of seed test shall not exceed 9 months.

Seed shall be of a quality that weed seed shall not exceed 0.5 percent of the aggregate of pure live seed (PLS) (% germination x % purity) and other material.

Fertilizer. All fertilizer shall be labeled in accordance with applicable state regulations and bear the warranty of the producer for the grade furnished.

Inoculants. The inoculant for treating legume seeds shall be a pure culture of Nitrogen fixing bacteria prepared specifically for the plant species and shall not be used later than the date indicated on the container. A mixing medium, as recommended by the manufacturer or approved substitute, shall be used to bond the inoculant to the seed. For non-sandy soils with a pH greater than 6.0 and that have previously grown well-nodulated crops of the same species within the last 5 years inoculation is usually not necessary. When planting legumes in sandy soil inoculant treatment shall be applied if the species has not been grown within the last 3 years.

Chemicals. All pesticides used in performing this practice shall be federally, state, and locally registered and shall be applied strictly in accordance with authorized and registered uses, directions on the label, and other federal or state policies and requirements. Chemical containers shall be properly stored and disposed of in a safe manner.

3. Seeding Mixture and Planting Date

The seed(s) and rate(s) specified on Form KS-ECS-4 shall be used.

The seeding rate(s) shall be the weight exclusive of any coating material. Any legume seed used shall be inoculated. Based on bag tags, seeding rates shall be adjusted to insure the required amounts of pure live seed.

Planting shall be performed during the period that is specified on Form KS-ECS-4.

4. Seedbed Preparation

The area to be planted shall be weed free and have a firm seedbed which has previously been roughened by scarifying, disking, harrowing, chiseling, or otherwise worked to a depth of 2 to 4 inches, except when planting no-till or otherwise specified on Form KS-ECS-4.

Seedbed preparation shall be suspended when soil moisture conditions are not suitable for obtaining a satisfactory seedbed.

When planting legumes requiring inoculation in soils with a pH lower than 6.0, amend the soil pH by liming according to soil test recommendations, prior to planting the legume.

5. Fertilizing and Seeding

Fertilizing. Fertilizer shall be distributed uniformly over the seedbed and applied according to a soil test within the criteria of Conservation Practice Standard 590, Nutrient Management, and as specified on Form KS-ECS-4.

Fertilizer shall be applied in any way that will result in uniform distribution. The fertilizer shall be incorporated into the soil. Incorporation may be as part of the seedbed preparation or as part of the seeding operation unless otherwise specified on Form KS-ECS-4.

Seeding. Seed shall be drilled or broadcast by hand, mechanical hand seeder, or power operated seeder. Seed shall be incorporated into the soil, but not more than 1 inch deep unless otherwise specified on Form KS-ECS-4. Drilling is preferred, but the use of row crop equipment may be used for row widths between 20 and 40 inches. Seed may be broadcast if covered with a drag or harrow.

When seeding in standing or growing row crops by air or during the last cultivation increase seeding rate 1.5 times.

Where wind erosion is a consideration, cover and temporary cover crops planted in rows greater than 20 inches will be planted perpendicular to the prevailing wind during the critical wind erosion management period.

Seeding shall be performed as nearly as practical across the slope unless otherwise specified on Form KS-ECS-4.

6. Irrigation

When specified, irrigation water shall be applied during the establishment period at the times and rates listed on Form KS-ECS-4.

7. Additional Cultural Operations

Managing cover crops.

(a) Suppression may be necessary to maintain the practice objectives during the period critical to the practices intended purpose and may be accomplished by mowing, light tillage and chemical applications

(b) Control of the cover crop will be necessary and should be planned for prior to planting the covers.

(1) Natural termination will be when climatic or growing conditions naturally terminate the cover crop such as freezing.

When ever possible plan cover crop plantings to take advantage of natural termination by the way of freezing, time planting to obtain the desired plant height or physiological development prior to the normally occurring killing frost date.

(2) Mechanical controls will be mowing, tillage, rolling or grazing.

(i) Mowing should be done prior to seed development. Height may be determined by other practices being implemented in a conservation plan.

(ii) Tillage may not provide complete control without repeating the application and may need to be used in a combination with other controls. Consideration should be given to timing and effects of tillage on moisture conservation and the rest of the crop rotation.

(iii) Rolling will be conducted in a way that will terminate the vascular transport functions of the cover crop. Rollers will be outfitted with horizontal knives or angle irons that are no more than 12 inches apart on the circumference of the roller. Knives or angle irons should not be sharp enough to chop the cover crop but the intended design is to lay over and crimp the plant stalks.

(iv) Grazing should be conducted at rates to allow re-growth to provide the necessary cover during the time critical to the intended purpose of the practice. Termination may require the application of herbicides or other treatment to control additional growth of the grazed cover crop.

(3) Chemical termination will be through the lethal application of herbicides.

Herbicides used to terminate growth shall be applied according the herbicide label and/or the KSU Extension Bulletin “Chemical Weed Control for Field Crops, Pastures, Rangeland and Non-cropland” prior to seed development or when the cover has accomplished the planned objective and will not create detrimental effects to the crop following, unless required for control of noxious weeds. Follow herbicide labels to determine crop compatibility for the crop following the cover crop.

(4) Grazing should be conducted at rates to allow re-growth to provide the necessary cover during the time critical to the intended purpose of the practice.

8. Other Requirements

Other details for the establishment and maintenance of the plants including, but not limited to, the need for livestock and traffic control shall be applied when specified on Form KS-ECS-4.

Measures and methods that enhance fish and wildlife values, protect visual resources, and maintain key shade, food, and den trees shall be performed when specified on Form KS-ECS-4.

For critical or highly erodible areas increase seeding rates 1.5 times the recommended rate to obtain an effective stand that will control erosion.

For temporary cover for acid sites. For a period of 1 to 3 years after land shaping, a temporary cover of a winter annual is to be used. Wheat, rye, oats or barley may be seeded at the rate of 80 pounds per acre. Apply needed nutrients as indicated by a soil test.

Prior to planting the second year temporary cover crop, soil tests will be taken as needed to determine lime requirements. Refer to Table 2 for liming rates. Apply nutrients as indicated by the soil test for the second year cover.

Specific soil tests should be conducted on areas of poor establishment of the first year cover to obtain a representative sample of problem areas. Retreat with recommended soil amendments as needed.

A third year temporary cover, nutrient, and soil amendment application may be used if need to obtain an adequate seedbed for permanent vegetation.

The owner, operator, contractor, or other persons shall conduct all work and operations in accordance with proper safety codes for the type of equipment and operations being performed with due regards to safety of all persons and property.

Crop substitutions. Sorghum-sudangrass may be substituted with pearle, proso, or foxtail millet or grain sorghum.

Rows shall not exceed 20 inches except grain sorghum rows can be 30 inches. In MLRA's 72, 73, 77, 78, and 79 where conditions do not permit the establishment of narrow row spacing, forage and grain sorghum in 40-inch rows may be used on sandy soils.

Seeding specifications will be documented with Form KS-ECS-4.

The following charts are reprinted from *Managing Cover Crops Profitably*, 2nd Edition, with permission from the Sustainable Agriculture Network (SAN). SAN is the national outreach arm of the USDA Cooperative State Research, Education, and Extension Service (CSREES) Sustainable Agriculture Research and Education (SARE) program. For more information, see www.sare.org.

Chart 2

PERFORMANCE AND ROLES

	Species	Legume N Source	Total N (lb./A)[1]	Dry Matter (lb./A/yr.)	N Scavenger[2]	Soil Builder[3]	Erosion Fighter[4]	Weed Fighter	Good Grazing[5]	Quick Growth
NONLEGUMES	Annual ryegrass *p. 55*			2,000–9,000	◕	●	●	◕	◕	●
	Barley *p. 58*			3,000–10,000	◕	◕	●	◕	◕	◕
	Oats *p. 62*			2,000–10,000	◕	◑	◕	●	◑	●
	Rye *p. 65*			3,000–10,000	●	●	●	●	◑	●
	Wheat *p. 72*			3,000–7,000	◕	◕	◕	◕	◕	◑
	Buckwheat *p. 77*			2,000–3,000	○	◑	◔	●	○	●
	Sorghum–sudan *p. 80*			8,000–10,000	●	●	●	◕	◕	●
LEGUMES	Berseem clover *p. 87*	●	75–220	6,000–10,000	◕	◕	◕	●	●	●
	Cowpeas *p. 95*	●	100–150	2,500–4,500	◔	◑	●	●	◑	◕
	Crimson clover *p. 100*	◕	70–130	3,500–5,500	◑	◕	◕	◕	●	◔
	Field peas *p. 105*	●	90–150	4,000–5,000	◔	◑	◕	◑	◕	◕
	Hairy vetch *p. 112*	●	90–200	2,300–5,000	◔	◕	◕	◕	◑	◔
	Medics *p. 119*	◑	50–120	1,500–4,000	◔	◑	◑	◕	◕	●
	Red clover *p. 127*	◕	70–150	2,000–5,000	◑	◕	◑	◕	●	◔
	Subterranean clover *p. 132*	●	75–200	3,000–8,500	◔	◕	◕	●	◕	◑
	Sweetclovers *p. 139*	●	90–170	3,000–5,000	◔	●	◕	◕	◕	◑
	White clover *p. 147*	●	80–200	2,000–6,000	◔	◑	◕	◕	●	◔
	Woollypod vetch *p. 151*	●	100–250	4,000–8,000	◑	●	◑	●	◑	◕

[1]Total N—Total N from all plant. [2]N Scavenger—Ability to take up/store excess nitrogen. [3]Soil Builder—Organic matter yield and soil structure improvement. [4]Erosion Fighter—Soil-holding ability of roots and total plant. [5]Good Grazing—Production, nutritional quality and palatability.

○=Poor; ◔=Fair; ◑=Good; ◕=Very Good; ●=Excellent

Chart 2

PERFORMANCE AND ROLES continued

	Species	Lasting Residue[1]	Duration[2]	Harvest Value[3] F*	Harvest Value[3] S*	Cash Crop Interseed[4]	Comments
NONLEGUMES	Annual ryegrass	◕	◑	◑	◔	●	Heavy N and H2O user; cutting boosts dry matter significantly.
	Barley	●	◑	◕	◑	◕	Tolerates moderately alkaline conditions but does poorly in acid soil < pH 6.0.
	Oats	◑	◔	◑	◑	●	Prone to lodging in N-rich soil.
	Rye	●	◕	◔	◔	◕	Tolerates triazine herbicides.
	Wheat	◕	◕	◑	◕	◔	Heavy N and H2O user in spring.
	Buckwheat	○	◔	○	◔	◕	Summer smother crop; breaks down quickly.
	Sorghum-sudangrass	◕	●	●	○	○	Mid-season cutting increases root penetration.
LEGUMES	Berseem clover	◑	●	●	◕	◑	Very flexible cover crop, green manure, forage.
	Cowpeas	◔	●	◑	◑	◑	Season length, habit vary by cultivar.
	Crimson clover	◑	◔	●	◕	●	Established easily, grows quickly if planted early in fall; matures early in spring.
	Field peas	◔	◑	●	◕	●	Biomass breaks down quickly.
	Hairy vetch	◔	◕	◔	◕	◑	Bi-culture with small grain expands seasonal adaptability.
	Medics	◑	◕	◑	◑	◑	Use annual medics for interseeding.
	Red clover	◔	◑	●	◕	●	Excellent forage, easily established; widely adapted.
	Subterranean clover	◕	◕	◕	○	●	Strong seedlings, quick to nodulate.
	Sweetclovers	◕	◕	◕	◑	◑	Tall stalks, deep roots in second year.
	White clover	◔	●	◕	◑	◕	Persistent after first year.
	Woollypod vetch	◔	◕	◔	◕	◑	Reseeds poorly if mowed within 2 months of seeddrop; overgrazing can be toxic.

[1]**Lasting Residue**—Rates how long the killed residue remains on the surface. [2]**Duration**—Length of vegetative stage.
[3]**Harvest Value**—Economic value as a forage (F) or as seed (S) or grain. [4]**Cash Crop Interseed**—Rates how well the cover crop will perform with an appropriate companion crop.

○=Poor; ◔=Fair; ◑=Good; ◕=Very Good; ●=Excellent

Chart 3A

CULTURAL TRAITS

	Species	Aliases	Type[1]	Hardy through Zone[2]	Tolerances: heat	drought	shade	flood	low fert	Habit[3]	pH (Pref.)	Best Established[4]	Min. Germin. Temp.
NONLEGUMES	Annual ryegrass *p. 55*	Italian ryegrass	WA	6	◔	◔	◕	◕	◔	U	6.0–7.0	Esp, LSu, EF, F	
	Barley *p. 58*		WA	7	◕	◕	◑	◔	◕	U	6.0–8.5	F,W, Sp	
	Oats *p. 62*	spring oats	CSA	8	◔	◔	◔	◑	◑	U	4.5–6.5	LSu, ESP W in 8+	
	Rye *p. 65*	winter, cereal, or grain rye	CSA	3	◑	◕	◕	◑	●	U	5.0–7.0	LSu-F	34F
	Wheat *p. 72*		WA	4	◑	◑	◑	○	◑	U	6.0–7.5	LSu, F	
	Buckwheat *p. 77*		SA	NFT	◑	○	◔	◔	◔	U to SU	5.0–7.0	Sp to LSu	50F
	Sorghum–sudan. *p. 80*	Sudax	SA	NFT	●	●	◑	◑	◑	U	6.0–7.0	LSp, ES	65F
LEGUMES	Berseem clover *p. 87*	BIGBEE, multicut	SA, WA	7	◕	◑	◕	◑	◑	U to SU	6.2–7.0	ESp, EF	42F
	Cowpeas *p. 95*	crowder peas, southern peas	SAL	NFT	●	◕	◑	◔	●	SU/C	5.5–6.5	ESu	58F
	Crimson clover *p. 100*		WA, SA	7	◑	◔	◕	◔	◑	U/SU	5.5–7.0	LSu/ESu	
	Field peas *p. 105*	winter peas, black peas	WA	7	◔	◑	◔	◔	◔	C	6.0–7.0	F, ESp	41F
	Hairy vetch *p. 112*	winter vetch	WA/CSA	4	◔	◑	◑	◔	◔	C	5.5–7.5	EF, ESp	60F
	Medics *p. 119*		SP/SA	4/7	●	◕	◕	◔	◑	P/Su	6.0–7.0	EF, ESp, ES	45F
	Red clover *p. 127*		SP, B	4	◔	◔	◕	◑	◔	U	6.2–7.0	LSu; ESp	41F
	Subterranean cl. *p. 132*	subclover	CSA	7	◑	◕	◕	◑	●	P/SP	5.5–7.0	LSu, EF	38F
	Sweetclovers *p. 139*		B/SA	4	◕	●	◔	◔	●	U	6.5–7.5	Sp/S	42F
	White clover *p. 147*	white dutch ladino	LP/WA	4	◑	◑	◕	◕	◑	P/SU	6.0–7.0	LW, E to LSp, EF	40F
	Woollypod vetch *p. 151*	Lana	CSA	7	◕	◕	◑	◑	◕	SP, C	6.0–8.0	F	

[1]B=Biennial; CSA=Cool season annual; LP=Long-lived perennial; SA=Summer annual; SP=Short-lived perennial; WA=Winter annual
[2]See USDA Hardiness Zone Map, inside front cover. NFT=Not frost tolerant. [3]C=Climbing; U=Upright; P=Prostrate; SP=Semi-prostrate; SU=Semi-upright. [4]E=Early; M=Mid; L=Late; F=Fall; Sp=Spring; Su=Summer; W=Winter
○=Poor; ◔=Fair; ◑=Good; ◕=Very Good; ●=Excellent

Esp	Sp	Lsp	Esu	Su	Lsu	Ef	F	Lf
2/15-5/15	4/15-5/20	5/10-6/10	6/1-7/1	6/15-8/15	8/1-9/15	9/1-10-15	10/1-11/15	11/1-12/1

Chart 3B

PLANTING

	Species	Depth	Seeding Rate					Cost ($/lb.)[1]	Cost/A (median)[2]		Inoc. Type	Reseeds[3]
			Drilled		Broadcast				drilled	broadcast		
			lb./A	bu/A	lb./A	bu/A	oz./100 ft²					
NONLEGUMES	Annual ryegrass	0–½	5–10	.2–.4	15–30	.6–1.25	1	.50	3.75	11.25		R
	Barley	¾–2	50–100	1–2	80–125	1.6–2.5	3–5	.05–.20	9.38	12.81		S
	Oats	½–2	80–110	2.5–3.5	110–140	3.5–4.5	4–6	.10–.20	14.25	18.75		R
	Rye	¾–2	60–120	1-2	90–160	1.5–3.0	4–6	.05–.20	6.75	9.38		R
	Wheat	½–1½	60–120	1–2	60–150	1–2.5	3–6	.05–.25	13.50	15.75		S
	Buckwheat	½–1.5	48–70	1–1.4	60–96	1.2–1.5	3–4	.28–.70	29–	38–		R
	Sorghum-sudangrass	½-1.5	35	1	40–50	1–1.25	2	.21–.66	15.05	19.35		S
LEGUMES	Berseem clover	¼–½	8–12		15–20		2	1.50	15.00	27.00	crimson, berseem	N
	Cowpeas	1–1½	30–90		70–120		5	.50	30	47.50	cowpeas, lespedeza	S
	Crimson clover	¼–½	15-20		22–30		2–3	1.50	26	39	crimson, berseem	R
	Field peas	1½–3	50–80		90–100		4	.25	16.25	26.25	pea, vetch	S
	Hairy vetch	½-1½	15–20		25–40		2	1.25	22	41	pea, vetch	S
	Medics	¼–½	8–22		12–26		2/3	1.50	22.50	28.50	annual medics	R
	Red clover	¼–½	8–10		10–12		3	1.85	16.65	20.35	red cl, wht cl	S
	Subterranean clover	¼–½	10–20		20–30		3	2.50	37.50	62.50	clovers, sub, rose	R
	Sweetclovers	¼–1.0	6–10		10–20		1.5	.70	5.60	10.50	alfalfa, swt cl	R
	White clover	¼–½	3–9		5–14		1.5	3.10	18.60	29.50	red cl, wht cl	R
	Woollypod vetch	½–1	10–30		30–60		2-3	1.05	21	47.25	pea, vetch	R,S

[1]Per pound in 50-lb. bags as of summer/fall 1997; legumes especially subject to price changes due to supply variability. To locate places to buy seed, see *Seed Suppliers* (p. 166). [2]Mid-point price at mid-point rate, seed cost only. [3]R=Reliably; U=Usually; S=Sometimes; N=Never (reseeds).

Chart 4A

POTENTIAL ADVANTAGES

	Species	Soil Impact: subsoiler	Soil Impact: Frees P&K	Soil Impact: Loosen Topsoil	Soil Ecology: nematodes	Soil Ecology: disease	Soil Ecology: allelopathic	Soil Ecology: choke weeds	Other: attract beneficials	Other: bears traffic	Other: short windows
NONLEGUMES	Annual ryegrass *p. 55*	◑	◑	●	◑	◑	◑	●	◔	●	●
	Barley *p. 58*	◑	◑	◕	◔	◔	◕	◕	◑	◑	●
	Oats *p. 62*	○	◔	◕	○	◑	◕	●	○	◑	●
	Rye *p. 65*	◔	◕	●	◑	◑	●	●	◔	◕	●
	Wheat *p. 72*	◑	◕	◕	◔	◔	◔	◕	◔	◑	◑
	Buckwheat *p. 77*	○	●	◕	◔	○	◕	●	●	○	●
	Sorghum–sudangrass *p. 80*	●	◑	◑	◕	◕	●	●	◑	◑	●
LEGUMES	Berseem clover *p. 87*	◔	◕	◕	○	○	◔	◕	◑	◔	◕
	Cowpeas *p. 95*	◑	◑	◕	○	○	○	●	◕	○	●
	Crimson clover *p. 100*	◔	◑	◑	◔	◑	◔	◑	◕	◔	◑
	Field peas *p. 105*	◔	◔	◕	◑	◕	◔	◕	◕	◔	◕
	Hairy vetch *p. 112*	◑	◑	◕	◔	◑	◑	◕	●	○	○
	Medics *p. 119*	◑	◔	◔	◑	◑	◔	◕	◔	◔	●
	Red clover *p. 127*	◕	◕	◑	◔	◔	◑	◑	◕	◑	◑
	Subterranean clover *p. 132*	○	◔	◑	◔	◔	◕	●	◕	◕	◕
	Sweetclovers *p. 139*	●	●	●	◔	◔	◔	◑	◕	◑	○
	White clover *p. 147*	◔	◔	◕	○	○	◑	◕	◑	●	◑
	Woollypod vetch *p. 151*	◕	◑	◕	◔	◔	◑	●	◕	◔	◑

○=Poor; ◔=Fair; ◑=Good; ◕=Very Good; ●=Excellent

Chart 4B

POTENTIAL DISADVANTAGES

		Increase Pest Risks			Management Challenges					
	Species	weed potential	insects/ nematodes	crop disease	hinder crops	establish	till-kill	mow-kill	mature incorp.	Comments Pro/Con
NONLEGUMES	Annual ryegrass	○[1]	◕	◕	◑	●	●	●	◑	If mowing, leave 3-4" to ensure regrowth.
	Barley	◔	◔	◔	◑	●	●	●	○	Can be harder than rye to incorporate when mature.
	Oats	●	◑	◕	◑	●	●	◔	◑	Cleaned, bin-run seed will suffice.
	Rye	○	◑	◕	◔	◕	◕	●	○	Can become a weed if tilled at wrong stage.
	Wheat	◑	◔	◔	◑	●	●	◕	◑	Absorbs N and H_2O heavily during stem growth, so kill before then.
	Buckwheat	○	◕	●	●	●	●	●	●	Buckwheat sets seed quickly.
	Sorghum–sudangrass	◑	◕	●	◔	●	◕	◕	◔	Mature, frost-killed plants become quite woody.
LEGUMES	Berseem clover	●	◑	◕	●	●	◔	◔	◕	Multiple cuttings needed to achieve maximum N.
	Cowpeas	●	◑	◕	●	●	●	●	●	Some cultivars, nematode resistant.
	Crimson clover	◑	○	◕	●	◕	◕	◕	◕	Good for underseeding, easy to kill by tillage or mowing.
	Field peas	●	◑	◔	●	●	●	●	◕	Susceptible to *sclerotinia* in East.
	Hairy vetch	◑	◑	●	●	◑	◔	●	◑	Tolerates low fertility, wide pH range, cold or fluctuating winters.
	Medics	◑	◔	●	◕	◕	◔	◕	◕	Perennials easily become weedy.
	Red clover	◑	◔	◕	●	◕	◑	◔	◕	Grows best where corn grows well.
	Subterranean clover	◑	○	◑	◑	●	◔	○	◕	Cultivars vary greatly.
	Sweetclovers	◔	◔	●	◑	●	◑	◕	◔	Mature plants become woody.
	White clover	◑	◑	◕	◔	◕	○	◑	◕	Can be invasive; survives tillage.
	Woollypod vetch	◑	◑	◔	◑	◑	◕	●	◔	Hard seed can be problematic; resident vegetation eventually displaces.

[1]Symbols, this page only: ○ =Could be a major problem. ◔ =Could be a moderate problem. ◑ =Could be a minor problem. ◕ =Occasionally a minor problem. ● =Rarely a problem